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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/328,911	06/09/1999	WALTER GELON	PA-98038	7456

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EXAMINER

BROADHEAD, BRIAN J

ART UNIT	PAPER NUMBER
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3661

DATE MAILED: 06/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/328,911

Applicant(s)

GELON ET AL.

Examiner

Brian J. Broadhead

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 April 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6-8,10-18,20-25,27,28 and 30-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6-8,10-18,20-25,27,28 and 30-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 June 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
2. Claims 1, 2, 4-8, 10-25, 27, 28, and 30-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Claim 1 recites the limitation "the intermediate orbit" in line 10. There is insufficient antecedent basis for this limitation in the claim.
4. Claim 23 recites the limitation "the intermediate orbit" in line 10. There is insufficient antecedent basis for this limitation in the claim.
5. Claims 30-32 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: It is not clear if both minimizing propellant usage and minimizing to achieve final orbit are required by the invention or if they are optional because they are separated by "and/or".
6. The remaining claims are rejected for being dependant on an indefinite claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claim 32 is rejected under 35 U.S.C. 102(b) as being fully anticipated by Porte, "Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft".

9. Porte discloses launching a spacecraft having chemical and electric propulsion thruster and a solar array on lines 6, section 3.4.3; a processor onboard the spacecraft wherein the processor generates a steering profile that steers a thrust vector to maintain the illumination of the sun's rays substantially normal to solar arrays of the spacecraft and steers the thrust vector such that the thrust vector is not normal to the axis of the solar array and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage or time to achieve orbit on page 2, section 3.2, third paragraph, and page 4, section 3.4.1, paragraph 3.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4, 6-8, 10-18, 20-25, 27, 28, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Porte, p., "Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft", in view of Tilley et al., 6186446.

3. As per claims 1, 6, 7, 8, 10, 11, 14, 15, 17, 18, 20, 21, 22, 23, 24, 25, 27, 28, and 33, Porte discloses launching a spacecraft with chemical and electrical propulsion and a

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solar array on page 6, section 3.4.3; firing the chemical propulsion at the apogees of the intermediate orbits, starting from the transfer orbit initiated by the launch vehicle, to successively raise perigees of the orbit until the spacecraft perigee substantially clears the Van Allen radiation belts, and where the semi-major axis of the intermediate orbit is substantially less than the semi-major axis of a final orbit, and where the inclination of the intermediate orbit is substantially greater than the inclination of the final orbit on page 2 section 3.1, strategy 3; firing the electric thrusters to raise the orbit of the spacecraft from the orbit achieved by the chemical thrusters firing step to near geosynchronous orbit by steering the thrust vector both in plane and out of plane while rotating the spacecraft body and steering the solar array to maintain the solar while rotating the spacecraft body and steering the solar array to maintain the sun's illumination on the solar array while not maintaining an earth facing panel on page 2 section 3.1, strategy 3; and selectively firing the chemical thruster to achieve geosynchronous orbit on page 2, columns 1-2; pointing the thrust away from the center of mass is inherent.

4. Porte does not disclose not maintaining the solar array rotation axis aligned with the orbit normal; the thruster firing profile is generated, and the spacecraft can be controlled on-board or from the ground; the step of firing the electric thruster is revised to compensate for disturbances; using momentum wheels; thrusters are differentially fired away from the center of mass for control torque and using thruster on the north and south side of the spacecraft to decrease the duration of the orbit raising phase.

Tilley et al. teach of not maintaining the solar array rotation axis aligned with the orbit

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normal on lines on lines 41-55, on column 4; the thruster firing profile is generated, and the spacecraft can be controlled on-board or from the ground on line 65, on column 2, through line 5, on column 3; and the step of firing the electric thruster is revised to compensate for disturbances on lines 2-5, on column 3; using momentum wheels on lines 55-57, on column 3; thrusters are differentially fired away from the center of mass for control torque and using thruster on the north and south side of the spacecraft to decrease the duration of the orbit raising phase on lines 1-3, on column 3; and a throttle back mode on lines 28-29, on column 3.

5. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Tilley et al. in the invention of Porte et al. because such modification would optimize thrust efficiency as disclosed in the background of Tilley et al.

6. As per claim 2, Porte discloses the thrust vector is maintained substantially normal to the axis of the solar array and the sun is normal to the solar array on page 2, column 2, paragraph 3 in section 3.2.

7. As per claim 4, Porte discloses that the transfer orbit is subsynchronous on page 2 section 3.1, strategy 3.

8. As per claims 12 and 13, Porte discloses a hybrid propulsion system to use both chemical and electric propulsion to achieve a final geosynchronous orbit in figure 1, strategy 3, and in section 3.4.3.

9. As per claims 16, Porte discloses firing the electric propulsion thrusters to raise the orbit of the spacecraft comprises pre-planned electric thruster coast periods that are

selectively shortened or lengthened in duration to compensate for disturbances on page 2, column 2. The apogee thrusting is done after a coasting period.

10. Claims 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Porte, p., "Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft", in view of Tilley et al., 6186446 as applied to claims 1, 18, and 23 above, and further in view of Hosick et al., 6032904.

11. Porte and Tilley disclose all the limitations as set forth above. Porte and Tilley do not disclose using gimbals to point the thrust or differential thrust away from the center of mass to provide control torque. Hosick et al. teach using gimbals to point the thrust or differential thrust away from the center of mass to provide control torque lines 49-51, on column 7. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use these teachings of Hosick et al. in the invention of Porte and Tilley because they are the conventional ways to control spacecraft. Gimballed thrusters are known as a way to reduce the necessary number of thrusters needed and to get the most thrust with the least amount of fuel because differential thrust can be reduced.

12. Claim 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Porte, p., "Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft", in view of Tilley et al., 6186446 as applied to claim 1 above, and further in view of Spitzer et al., 5595360.

13. Porte and Tilley disclose the limitations set forth above. Porte and Tilley do not disclose the transfer orbit is supersynchronous. Spitzer et al. teach of using a transfer

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orbit that is supersynchronous on lines 65-67, on column 6. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a supersynchronous orbit because such modification would provide longer burn time for raising perigee and decreasing inclination as stated on lines 1-5, on column 7 of Spitzer et al.

Allowable Subject Matter

10. Claims 30 and 31 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

11. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record does not disclose steering the thrust vector so that thrust vector is not normal to the axis of the solar array.

12. Applicant's arguments filed 6-23-05 have been fully considered but they are not persuasive. The argument that the invention does not disclose clearing the Van Allen belts is not convincing since it is functional language that the cited prior art is fully capable of performing. To get to geosynchronous orbit the perigee has to clear the Van Allen Belt and the 15,000km that is disclosed as being achieved by the chemical burn is above the Van Allen belt. The argument that a solar array is not mentioned in the strategy is not convincing, Porte discloses keeping the solar array lit in section 3.2. Also, figure 1 clearly details the burns at apogee and the larger semi-major axis at final orbit. The discussion of strategy 3, in section 3.1, discloses that the initial orbit is a high inclination orbit and this is corrected by both the electric and chemical thrusters. The argument that steering the thrust vector both in-plane and out-of-plane while rotating the spacecraft body and steering the solar array to maintain illumination is not disclosed on

not convincing. Since the cited prior art is correcting inclination, some of the thrust must be out of plane and this is mentioned in the first paragraph of section 3.4.3. As mentioned above, the solar array is disclosed as being kept illuminated in section 3.2. It is also mentioned in section 3.2 that the thruster is kept orientated along its velocity vector. This means the craft is rotating as it orbits. The argument that there is not a disclosure of firing selected ones of chemical and electric propulsion to achieve final geosynchronous orbit is not convincing. Prior art discloses that the electric thruster brings the orbit altitude up to geosynchronous altitude, but a final chemical burn performs circularization. This meets the limitation.

13. The arguments with respect to Tilley are not convincing. Tilley discloses keeping the sun vector in the xz plane of the satellite. With the changes in inclination of the orbits and the constraint of the array being aligned to the y axis the array will need to not be aligned with the orbit normal in order to keep full, or almost full illumination.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

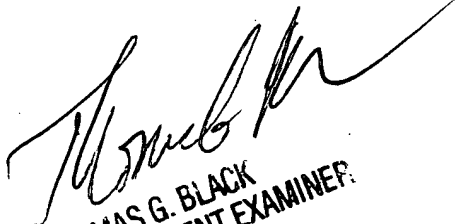
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Broadhead whose telephone number is 571-272-6957. The examiner can normally be reached on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Black can be reached on 571-272-6956. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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